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SOME EFFECTS OF FROST IN THE SOUTHWEST

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To what extent a severe spring frost in the southwest may injure forest growth is shown by a series of interesting observations by Mr. Frank J. Phillips.* The fact that a large number of tree species in the Chiricahua Mountains of Arizona failed to bear fruit in the autumn of 1907, may have been due to the same cold wave that defoliated the young trees in certain parts of the New Mexican mountains. In 1906 many of these species fruited abundantly notwithstanding the fact that this was a drier season than 1907. It is possible that the general backwardness of the latter season also may have had something to do with it. The pines, however, are known to be intermittent in their seed-bearing habits. The following is a list of Chiricahua species with the seed crops of 1906 and 1907 compared. In many cases the same individuals were observed both years :

	1906	1907
Walnut (<i>Juglans rupestris</i>)	An abundant crop of nuts	Not a single nut found
Sycamore (<i>Platanus Wrightii</i>)	Balls plentiful	No balls apparent
Cherry (<i>Prunus salicifolia</i>)	A good crop of wild cherries	Not a single cherry seen
Box elder (<i>Acer Negundo</i>)	A limited crop of samaras	No samaras found
Ash (<i>Fraxinus</i> sp.)	Trees loaded with fruit	Crop small or absent
Cascara (<i>Rhamnus</i> sp.)	Fruiting abundantly	No fruit observed
Grape (<i>Vitis</i> sp.)	A large crop	A small crop
Oaks, seven species observed	Acorns common to abundant	Acorns absent or few †
Arizona pine (<i>Pinus arizonica</i>)	Good crop, many trees loaded with cones	Crop very poor, one might travel half a day to find one cone

* Forestry and Irrigation, September, 1907.

† One or two species, however, ranging below 5,000 feet altitude, bore an abundant crop. With exception of these and the ash, none of the species named descends to this level within the region observed.

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Mexican white pine (<i>P. strobiformis</i>)	Many trees conspicuously filled	No cones apparent
Douglas fir (<i>Pseudotsuga taxifolia</i>)	Cones very abundant	Cones scarce
White fir (<i>Abies concolor</i>)	No cones found in either year	

In the fall of 1906, the first two severe frosts occurred in the aforesaid mountains on the nights of October 22 and 23. Practically all the herbaceous plants were killed to the ground. A few days later the deciduous tree species along Riggs Creek were examined. *Juglans rupestris*, *Fraxinus*, and *Vitis* had all their leaves killed, proving to be the ones most easily injured. *Schmaltzia* was almost killed in this open canyon, yet in the narrow Bonita Canyon near by, which has high, perpendicular walls, this genus was collected a week later, remarkably preserved. Certain acacias behaved likewise. Sycamore did not suffer greatly, but the least harm came to the willow and the cherry. The leaves of the latter hang on the tree till very late in autumn, hardly losing their green color before they fall. Of all the deciduous arboreal species of this region, this approaches most nearly the evergreen habit. Thus it is possibly relatively frost-hardy for the same reasons as the very frost-resistant as well as drouth-defiant evergreens, such as the oaks. On the whole it appeared that the species which lived upon the least moisture were also the most frost-hardy.

On the other hand, as is well known, the presence of an abundance of water has often a powerfully protective effect. The snowberry (*Symphoricarpus*), growing at an altitude of 8,000 feet, had its leaves nearly killed where growing in the open, severely bitten where standing under trees, damaged but little where growing without a canopy but on springy soil, and escaped without any harm whatever where it stood under the spreading boughs of the white fir while the water trickled about its roots.

Other shrubby genera occurring in this place are *Opulaster*, *Holodiscus*, *Rubus*, *Salix*, and *Ptelea*, but *Symphoricarpus* appears to be the hardiest of all.